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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/038,510	01/03/2002	Wang Nang Wang	0008/OA011	5465

7590 11/24/2004
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EXAMINER

HO, TU TU V

ART UNIT PAPER NUMBER

2818

DATE MAILED: 11/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center">Office Action Summary</p>	Application No. 10/038,510	Applicant(s) WANG ET AL.	
	Examiner Tu-Tu Ho	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 January 2002 and 04 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-17 is/are rejected.
- 7) ☒ Claim(s) 8 and 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>01-03-02</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 03/14/2002 is acceptable.

Claim Rejections - 35 USC § 102 and § 103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 1, 3, and 4** are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Jewell U.S. Patent 5,617,445 (hereinafter referred to as the '445 patent).

The '445 patent discloses in the figures, particularly Figs. 1A, 3E, and 6, and respective portions of the specification a light generation device substantially as claimed.

Referring to **claim 1**, the '445 patent discloses a light generation device comprising:

a conducting substrate (12, Fig. 1A, column 6, lines 8-20);

a lower electrode (46, column 6, lines 8-20) formed on said substrate;

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a triangle (Fig. 3E) mesa (Fig. 6 particularly) structure (146, Fig. 3E, column 9, lines 5-14) having an optical cavity (best seen in Fig. 4 and generally defined by the space defined by surfaces 160, 162, 28, and 28' of Fig. 4) formed on said substrate for lateral light confinement (Figs. 3E, 1A, and 4, the sentence bridging columns 1 and 2, column 5, lines 45-67) wherein said mesa structure is of a triangle structure;

wherein said triangle mesa structure further comprises:

an active layer (18); and

a lower conducting mirror (14, Fig. 1A) and an upper conducting mirror (22, column 6, lines 8-20) for vertical light confinement (column 3, lines 49-55, and best seen in Fig. 4).

However, the '445 patent' top contact 44 appears to be a single metal layer (column 6, lines 8-39) formed on said upper conducting mirror instead of a contact layer formed on said upper conducting mirror and a metallic contact formed on said contact layer as claimed.

Nevertheless, the missing feature is either 1) inherent in the top mirror 22 since the top mirror 22 is a multi-layer (Fig. 1A), and since the metal contact 44 appears to be in direct contact with the multi-layer mirror, the top layer of the multi-layer mirror could easily be perceived as a contact layer; hence the '445 patent discloses a contact layer (top layer of the multi-layer mirror) formed on said upper conducting mirror (the multi-layer mirror minus the top layer) and a metallic contact (44) formed on said contact layer as claimed; or 2) obvious because a metal contact layer formed on said upper conducting mirror and a contact layer formed on said upper conducting mirror and a metallic contact formed on said contact layer are functionally equivalents as contact layers.

Referring to **claim 3**, the '445 patent further discloses that light is generated in said active layer that is vertically output through said metallic contact as a result of applying an electrical current through said metallic contact which is linked to said contact layer, said lower electrode, said lower mirror and said conducting substrate, as is evident from the arrow 47 of Fig. 1A.

Referring to **claim 4**, the '445 patent further discloses that said active layer is made of a quantum well (throughout the specification, including the title).

3. **Claims 9-10** are rejected under 35 U.S.C. §103(a) as being unpatentable over the '445 patent.

Referring to **claim 9**, the relative positions of the lower cladding layer and the lower conducting mirror of the claim and the reference are reverse. However, since both the present invention and the reference fail to specify the differences between the two designs, the change from one to another would have been obvious. Referring to the limitation "said upper conducting mirror serves as an interface between said optical cavity and said contact layer, Figs. 1A and 4 depicts upper conducting mirror 22 serving as an interface between the optical cavity (as detailed above for claim 1) and the contact layer 44.

Referring to **claim 10**, the '445 patent discloses a light generation device substantially as claimed and as detailed above including the lower cladding layer but fails to specify a material for the cladding layer. However, the claimed materials (n-type AlGaAs...) is available in the art and it is well within the skill of one in the art at the time the invention was made to select and therefore providing the claimed materials would have been obvious.

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4. **Claims 11-13 and 16-17** are rejected under 35 U.S.C. §103(a) as being unpatentable over the '445 patent as applied above, and further in view of Ohba et al. U.S. Patent 5,656,832 (the '832 patent).

Referring to **claims 12 and 16**, the '445 patent discloses a light generation device substantially as claimed and as detailed above including the substrate 12 and the triangle mesa light emitting structure but fails to disclose a buffer layer between the substrate and the triangle mesa light emitting structure, the triangle mesa light emitting structure is a GaN based structure. The '445 patent further fails to disclose a material for the substrate but mentions that modification to the device is possible (column 13, lines 23-30). The '832 patent, in disclosing a light generation device comprising a substrate and a mesa light emitting structure, teaches that when a mesa light emitting structure formed on a substrate of a material different from that of the mesa light emitting structure, particularly when the substrate is formed of sapphire, there is a potential for lattice mismatch, and a remedy would be to form a buffer layer between the substrate and the triangle mesa light emitting structure (*Description of The Related Art*). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the '445 patent's light generation device having a buffer layer between the substrate and the triangle mesa light emitting structure. One would have been motivated to make such a modification in view of the teachings by the '832 patent that a buffer layer between the substrate and the triangle mesa light emitting structure relieves lattice mismatch between the substrate and the triangle mesa light emitting structure, the lattice mismatch resulting from the material differences between the substrate and the triangle mesa light emitting structure, particularly when the triangle mesa light emitting structure is GaN based, as is claimed and

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disclosed by the cited references, and the substrate is formed of sapphire, as is claimed and disclosed by the cited references. Referring to the limitation BaGaInN as a material for the buffer layer, the '832 patent disclose AlN ; however, selecting the mentioned materials would have been within the skill of one in the art at the time the invention was made and therefore would have been obvious.

Referring to **claims 13 and 16**, the '832 patent further discloses that the buffer layer further comprises a GaN layer (cap layer 13 or 53) between said buffer layer and said triangle mesa structure for preventing evaporation of some of the component materials of the buffer layer. Although the GaN layer of the '832 patent lacks the feature "conducting" and further lacks the "n-" (n dopant) feature as claimed, the lacking features would be inherent in the GaN layer of the '445 patent's light generation device modified in view of the '832 patent, or prior art device for short, since electrical energy has to go through the GaN layer, hence conducting and doped as is known in the art, to the active layer from the bottom contact of the prior art device, for the prior art device to function.

Referring to **claim 11**, as noted, the prior art's substrate is sapphire.

Referring to **claims 16 and 17**, as noted above for claims 9 and 10, , the relative positions of the lower cladding layer and the lower conducting mirror and the claimed available materials do not contribute to the criticality of the characteristics of the device and therefore would have been obvious

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5. **Claims 2 and 5-7** are rejected under 35 U.S.C. §103(a) as being unpatentable over the '445 patent as applied above, and further in view of Jewell et al. U.S. Patent 4,949,350 (the '350 patent).

Referring to **claims 2, 5, and 7**, the '445 patent discloses a light generation device as claimed and as detailed above including lower and upper conducting mirrors 14 and 22 formed of an unspecified material, thus fails to disclose that the lower conducting mirror is formed of an n-type AlGaAs superlattice and the upper conducting mirror is formed of a p-type AlGaAs superlattice. The '350 patent, in disclosing a light generation device, teaches that a multi-layer mirror, such as the multi-layer mirrors 14 and 22 disclosed by the '445 patent, comprising AlGaAs superlattice reduces the overall resistance (column 4, first paragraph). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the '445 patent's mirrors comprising AlGaAs superlattice. One would have been motivated to make such a modification in view of the teachings in the '350 patent that mirrors comprising AlGaAs superlattice reduces the overall resistance. As for the limitation n-type and p-type, the lower and upper semiconductor mirrors must be doped with the n-type and p-type to function just as detailed in the cited passage.

Referring to **claims 5-7**, the '445 patent's light generation device modified in view of the '350 patent comprises all limitations as claimed including conducting substrate 12 ('445 patent, Fig. 1A), the optical cavity, the active layer 18 consisting of a quantum well of InGaAsN/GaAlAs (column 13, lines 25-36), and the semitransparent metallic contact 44 (column 6, lines 20-22), but fails to specify a material for the conducting substrate and the optical cavity. However, the claimed materials (GaAs, InP,...) are available in the art and it is well within the

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skill of one in the art at the time the invention was made to select and therefore providing the claimed materials would have been obvious. The same obviousness could be found for the material of the mirrors claimed in claim 6.

6. **Claims 14-15** are rejected under 35 U.S.C. §103(a) as being unpatentable over the '445 patent in view of the '832 patent as applied above, and further in view of Jewell et al. U.S. Patent 4,949,350 (the '350 patent).

The '445 patent's light generation device modified in view of the '832 patent as detailed above - for addition of the buffer layer between the substrate and the triangle mesa light emitting structure for relieving lattice mismatch between the substrate and the triangle mesa light emitting structure - lacks the limitation superlattice for the mirrors. However, also as detailed above, the lacked superlattice feature could be remedied by the teachings of the '530 patent for reducing resistance. Furthermore, the '445 patent's light generation device modified in view of the '832 patent and the '530 patent lacks the claimed materials for the substrate and the optical cavity. Nevertheless, just as explained above for claims 5-7, the claimed materials (GaAs, InP,...) are available in the art and it is well within the skill of one in the art at the time the invention was made to select and therefore providing the claimed materials would have been obvious.

7. **Claims 1 and 4** are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Behfar-Rad et al. U.S. Patent 4,851,368 (hereinafter referred to as the '368 patent).

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The '368 patent discloses in the figures and respective portions of the specification a light generation device substantially as claimed. The '368 patent discloses a light generation device having an optical cavity defined generally as 30 (Figs. 2 and 5), unspecified contacts, and vaguely defined mirrors.

Specifically, the '368 patent discloses a light generation device comprising:

a conducting substrate (60, formed of n+Ga, Fig. 4A);

a lower electrode ("propagating light energy is indicated by the arrows 101 and 102, and is produced by a bias voltage connected across the laser body; i.e. applied to the top surface 104 and the bottom surface 106 by way of suitable metallized contacts", column 7, lines 40-50) formed on said substrate;

a triangle (best seen in Figs. 2 and 5) mesa structure having an optical cavity (defined generally as 30) formed on said substrate for lateral light confinement (best seen in Fig. 5) wherein said mesa structure is of a triangle structure;

wherein said triangle mesa structure further comprises:

an active layer (70, "quantum well", referring to claim 4); and

a lower conducting mirror (n-confinement layer 66 or linear graded layer 68 as these layers reflect the generated light to some degree) and an upper conducting mirror (p-confinement layer 74 or linear graded layer 72 as these layers reflect the generated light to some degree) for vertical light confinement.

However, the '368 patent' top contact appears to be a single metal layer ("propagating light energy is indicated by the arrows 101 and 102, and is produced by a bias voltage connected across the laser body; i.e. applied to the top surface 104 and the bottom surface 106 by way of

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suitable metallized contacts”) formed on said upper conducting mirror instead of a contact layer formed on said upper conducting mirror and a metallic contact formed on said contact layer as claimed.

Nevertheless, the missing feature is either 1) inherent if the p-GaAs cap layer 76 (column 6, lines 30-35) is perceived as a contact layer; hence the ‘368 patent discloses a contact layer 76 formed on said upper conducting mirror (p-confinement layer 74 or linear graded layer 72) and a metallic contact (“suitable metallized contacts”) formed on said contact layer as claimed; or 2) obvious because a metal contact layer formed on said upper conducting mirror and a contact layer formed on said upper conducting mirror and a metallic contact formed on said contact layer are functionally equivalents as contact layers.

Allowable Subject Matter

8. **Claim 8 and 18** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner’s statement of reasons for the indication of allowable subject matter: The cited art, whether taken singularly or in combination, especially when all limitations are considered within the claimed specific combination, fails to teach or render obvious a light generation device having all exclusive limitations as recited in claims 1/8 (claims 1 and 8) and claims 1/18, characterized in the lateral light confinement, vertical light confinement, the triangle mesa structure, and a sidewall deflector having an optical grating or a mirror sidewall deflector formed in or on the lower conducting mirror.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho
November 17, 2004